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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/541,089	03/31/2000	Takeuchi Hiroaki	0397-0404P	4024

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EXAMINER

PADGETT, MARIANNE L

ART UNIT

PAPER NUMBER

1762

DATE MAILED: 02/13/2002

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Please find below and/or attached an Office communication concerning this application or proceeding.

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Office Action Summary

Application No.

09/541,089

Applicant(s)

Takeuchi et al

Examiner

M.L. Palyet

Group Art Unit

1762

— The MAILING DATE of this communication appears on the cover sheet beneath the correspondence address —

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, such period shall, by default, expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- ☒ Responsive to communication(s) filed on 3/31/00 + 7/8/00
- ☐ This action is FINAL.
- ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.

Disposition of Claims

- ☒ Claim(s) 1-8 is/are pending in the application.
- Of the above claim(s) _____ is/are withdrawn from consideration.
- ☐ Claim(s) _____ is/are allowed.
- ☒ Claim(s) 1-8 is/are rejected.
- ☐ Claim(s) _____ is/are objected to.
- ☐ Claim(s) _____ are subject to restriction or election requirement

Application Papers

- ☐ The proposed drawing correction, filed on _____ is ☐ approved ☐ disapproved.
- ☐ The drawing(s) filed on _____ is/are objected to by the Examiner
- ☐ The specification is objected to by the Examiner.
- ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119 (a)-(d)

- ☒ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119 (a)-(d).
- ☒ All ☐ Some* ☐ None of the:
- ☒ Certified copies of the priority documents have been received.
- ☐ Certified copies of the priority documents have been received in Application No. _____
- ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a))

*Certified copies not received: _____

Attachment(s)

- ☒ Information Disclosure Statement(s), PTO-1449, Paper No(s) 4
- ☐ Interview Summary, PTO-413
- ☒ Notice of Reference(s) Cited, PTO-892
- ☐ Notice of Informal Patent Application, PTO-152
- ☐ Notice of Draftsperson's Patent Drawing Review, PTO-948
- ☐ Other _____

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1. Claims 1-8 are objected to or rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The use of the phrase "or the like" (claim 1, line 2) is vague and indefinite, because it is uncertain what scope is encompassed by such a limitation.

In claim 3, line 3 "near a lower limit of a range which is within a range..." has no clear apparent meaning. What is "near" an undefined lower limit, is relative since "near" is a relative term lacking clear metes and bonds. As written, claim 3 reads on any pressure within the claimed range.

Claim 4 is objected to for using inconsistent terms, ie P_r and P_r .

Claim 5 is objected as being written in non-idiomatic English. Particularly see lines 5-9. While the examiner suspects that these lines maybe intended to represent an alternative relationship, as written the "and" requires that both be satisfied. It is also unknown what P_L is intended to pertain to. Some imaginary pressure? The pressure of something that is not used, or has no use in the process, is irrelevant to the process steps.

Also, in claim 5, line 10 "a frequency" is objected to as using the wrong article for a previously introduced limitation. In line 3 of claim 8 "a substrate" is similarly objected to.

2. In applicant's IDS, it is noted that only 3 of the references cited on the 1449 were supplied, but 3 other references that were NOT listed were included also. Those have been recorded on the form and reviewed.

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3. It is noted that the relationship of parameters in claim 1 read on any pressure at 500 torr or less that is used with a high frequency power of 2.5 GHz or 2.5×10^9 Hz, or less. High frequencies may be considered to go down to 300 KHz or 3×10^5 Hz, which would give a lower pressure limit of 0.06 torr. For the standard RF frequency of 13.56 MHz, applicant's formula gives $(2 \times 10^{-7})(13.56 \times 10^6) \text{ torr} = 2.712 \text{ torr} \leq P \leq 500 \text{ torr}$.

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless --

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 1-5 and 8 are rejected under 35 U.S.C. 102(e) as being clearly anticipated by Foster et al .

Foster et al teach a PECVD process where a shower head positioned above a substrate is also an RF electrode. The useful applied frequencies are taught to range from 450 KHz to 13.56 MHz, while useful pressures are given as 0.5 to 100 torr in the reaction or deposition space (Abstract; col. 4, lines 8-30 and 53-60; col. 5, lines 32-col. 6, line 14; col. 7, lines 40-68*; col. 8,

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lines 39-55⁺; col. 12, lines 1-11 and 44-55). Foster et al discuss various Ti and TiN depositions on col. 12-17, with tables 4, 5 and 6 being of particular interest as using parameters of 5 torr total pressure at 450 KHz, where gases of TiCl_4 (5 or 10 sccm), H_2 (5,000 sccm or 3,750 sccm) and Ar (0.5 or 0.3 slm), have proportions that would appear to provide partial pressures of reactant gas TiCl_4 within the claimed ranges. In col. 16, lines 15-24, it is noted that the higher pressure (5 vs. 1 torr) provides a more stable and symmetric plasma, and that the addition of Ar increases the plasma stability and intensity, such that 0-10 slm Ar flow is preferred for this particular reaction.

6. Claims 6-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Foster et al .

Foster et al's specific example does not use the inert gas He, nor specify $10 \text{ MHz} \leq f \leq 500 \text{ MHz}$, plus $100 \leq P \leq 500 \text{ torr}$, however as the benefits to plasma stability and intensity, of using Ar, an inert gas, is taught, it would have been obvious to one of ordinary skill in the art that other inert gases, such as He, would have been expected to be equally useful, because they are homologous, ie. have like chemical and plasma properties, and are well known for use as both plasma and carrier gases.

Foster et al's taught generic ranges include both 13.56 MHz and 100 torr explicitly, hence it would have been obvious to one of ordinary skill to expect these to be useful together in PECVD process a suggested by Foster et al's teachings, that are inclusive of these values and because one would optimize for variations in types of depositions bring preformed, etc.

7. Claims 1-8 are rejected under 35 U.S.C. 102(e) as being clearly anticipated by .

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Yamazaki et al.

Yamazaki et al teach various high frequency plasma apparatus, where there is a discharge between two opposed electrodes, one holding a substrate. The pressure between the electrodes is taught to be 15 torr to 100 torr, although higher pressures are also discussed. The RF frequency taught to be applied with these pressures is 13.56 MHz. See the abstract; figures (9,13, etc); col. 3, lines 54- col. 4, line 8; col. 6, lines 18-57; col. 7, lines 3-26 (He + hydrocarbon deposition gas, 60-100 torr); col. 17, lines 1-32 (13.56 MHz; 100 torr; He:CH₄ at 100 sccm:10 sccm); col. 18, lines 28- col. 20, lines 59 (more examples).

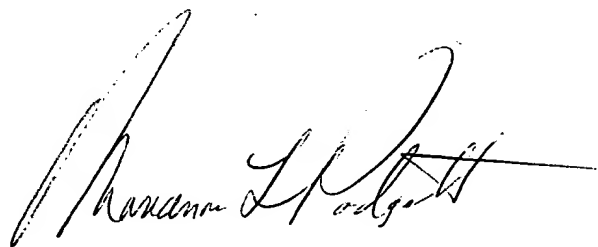
8. A small sampling of other references that also have frequency and pressure parameters consistent with the ranges defined by applicants' formula include: Mak et al, Gupta et al, Lee et al, Perng et al, Sharan et al and Chang et al.

9. Any inquiry concerning this communication should be directed to M.L. Padgett at telephone number (703) 308-2336 on Monday-Friday from about 8 am to 4:30 pm; and fax #(703) 305-5408 (official); and 305-6078 (unofficial)

M.L. Padgett:evh

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02/12/02



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